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Circular No. 819

April 1949 • Washington, D. C.

UNITED STATES DEPARTMENT OF AGRICULTURE

Feed Required to Produce 6-Pound Rabbits After Weaning and Conditions Affecting their Carcass Grades and Cuts

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INTRODUCTION

The production of rabbit meat on a commercial scale has been practiced only during the last 20 years and received special consideration during World War II. In general livestock production, animals of different qualities are fed to various weights and degrees of fatness in accordance with market demands. Adjustments have been made over a period of many years after repeated trials by practical livestock feeders and after extensive experiments by State and Federal agencies as to kinds of feed, nutritive requirements, and the quality of carcass to be marketed. Stockmen have made splendid progress in grading up their herds by the use of good-type purebred sires. All these livestock-improvement practices and nutrition studies have resulted in desirable types of meat and dairy animals that respond to different methods of feeding.

In contrast to all this research on livestock, very few studies have been made on the production of rabbit meat and only limited research has been conducted on the feed requirements for rabbits of any age. In recent years there has been a demand for a larger and meatier rabbit than those now marketed at a weight of about 3 pounds. Meat from the larger rabbits is known to have better flavor, texture, and substance than that of rabbits finished at about 60 days of age.

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The staff at the U. S. Rabbit Experiment Station at Fontana, Calif., undertook an extensive feeding experiment to obtain more definite information on the nutrition required to produce 6-pound rabbits. This station, which is near Los Angeles, is ideally located as it is in the heart of the area in which approximately two-thirds of the commercially raised rabbits in the United States are produced.

This publication describes the findings of the experiment. It shows the kind of feeds used in several types of rations fed to New Zealand rabbits from weaning time until they attain a weight of 6 pounds (fig. 1). It also deals with the quality of carcasses and the percentages of the various cuts of meat from these carcasses, and the possible influence of some apparently contributing factors.

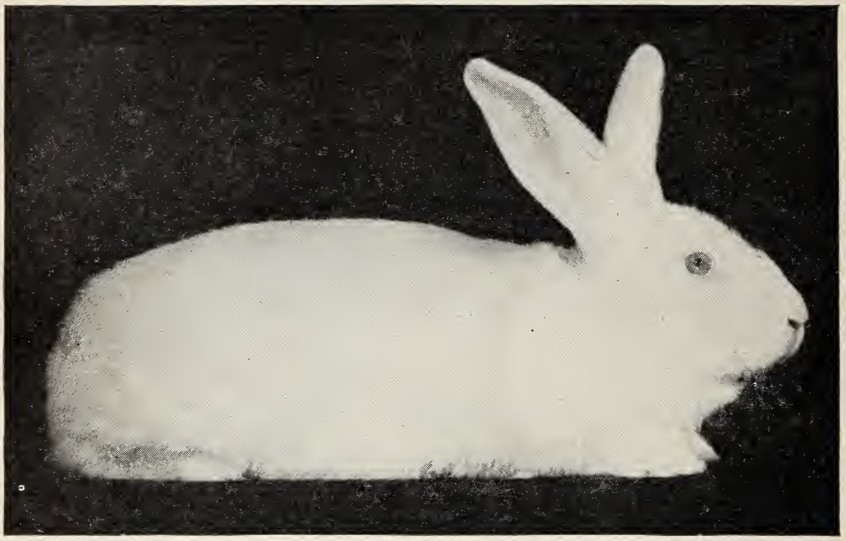

Figure 1.—A typical 6-pound New Zealand White rabbit.

This study does not take into consideration the economics or relative cost of production, the differences in flavor and texture of meat of the younger versus somewhat older rabbits, nor the grades and quality of skins.

MATERIALS AND METHODS

Nearly 750 New Zealand White and New Zealand Red rabbits 58 to 63 days of age were used in the experiments. All had been weaned at the age of 56 days. Only entire litters of 3 or more were used, and a sufficient number of litters from the same experimental ration and within a few days of the same age were included in lots of approximately 10 young animals each. Three to eight lots made up groups of animals receiving the same experimental ration, the lots being started at different times as 10 or more young became available. The lots are identified by Roman numerals and the groups are designated by the letters A to N, inclusive. Each animal was tattooed on an ear, for purposes of identification. Their weights were recorded on three successive days to establish the average initial weights. Some lots were kept in developing pens; the others were housed in numerous hutches similar to those used for the does and litters (fig. 2). Of the 750 rabbits that were placed in the experiment, 610 finished.

Individual weekly weights were taken throughout the experiment and the weights of those that died were recorded. When any animal attained a weight of 6 pounds or slightly over, it was removed from the experiment after its weight had been rechecked on two successive days. The 6-pound live weight was arbitrarily set as a practical upper limit of a market weight, since the preference in many areas is for rabbits approximating this weight rather than for rabbits weighing only 3½ to 4 pounds.

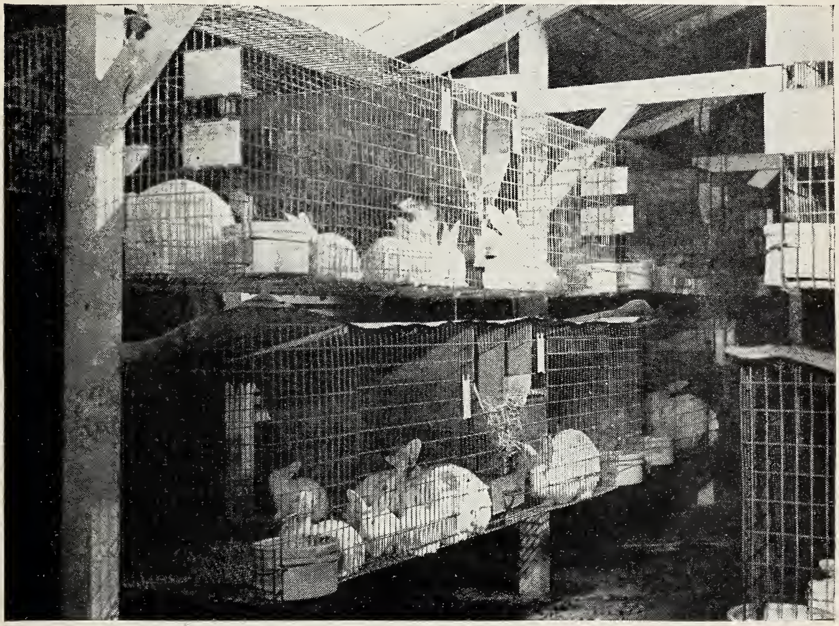

FIGURE 2.—A section of the rabbitry at the U. S. Rabbit Experiment Station. The all-metal hutches are sanitary and economical over a period of years. An overhead sprinkler is operated on hot days.

A few of the better animals, particularly the does, were removed from the experiment when they had attained the desired weight of 6 pounds and were retained as breeders. However, most of them were slaughtered and the carcasses graded according to tentative United States Government standards. Weights of all cuts of meat, the various organs, skin, and offal also were recorded.

In order to obtain information on the effects of castration on feed requirements and marketable quality of carcass, all bucks in the latter part of the experiments were castrated at weaning time. They continued to receive rations similar to those fed the does, but their feed records were kept separately. For convenience in discussion and reference, this latter part of the experiments is referred to as part II to distinguish it from part I, in which no bucks were castrated.

FEEDS AND FEEDING

Throughout these experiments the animals continued to receive the same kind of feed as that fed the doe and young during the suckling period. The rabbits in all groups were fed all the U. S. No. 1 alfalfa hay they would consume twice daily. The amounts of concentrates fed were so regulated as to insure a consumption equal to two-thirds that of the hay, i. e., 40 percent of the total ration consumed. All the grain concentrates were rolled or ground and were mixed with the desired protein meals and minerals before being fed in troughs twice daily. The concentrate mixture was fed dry to some groups and moistened to others. A small amount of green feed was fed to some of the groups.

Morrison's [2] tables of digestible nutrients based upon digestion trials with larger animals were used in figuring nutritive ratios since comparable data on rabbits have never been determined.

Groups A to E, inclusive, were designed to give information on nutrive ratios [3] of 1:4.4, 1:3.7, 1:3.2, 1:2.8, and 1:3.7, respectively. A basal concentrate mixture of 45 pounds of rolled barley, 22½ pounds of red wheat bran, 22½ pounds of rolled oats, and 10 pounds of dried skim milk was made up and then a sufficient quantity of peanut meal was added to the ration, including hay, to get the nutritive ratio desired in each case. No peanut meal was required for group A. To each 100 pounds of the final concentrate mixture for each group, 2 pounds of odorless bonemeal, 1 pound of cod-liver oil, and ½ pound of salt were added. Since the quantity of the peanut meal varied and the concentrate part of the ration was kept on a 40-percent level of the entire ration, the proportionate ingredients of the complete rations as finally fed varied considerably.

The experiments with groups F to J, inclusive, had for their general purpose the determination of the relative feeding value of the various protein supplements in peanut meal, soybean meal, cottonseed meal, linseed meal, and sesame meal. The basal mixture used was the same as that for groups A to E but a sufficient quantity of the particular supplement was added in each case to provide the common nutritive ratio of 1:3.7 for each complete ration as finally fed. A small amount of green feed was given to each group except lot IV of group H and group J.

Groups K to N, inclusive, were used to evaluate the grains as rabbit feed. A basal mixture of 20 pounds of wheat bran, 10 pounds of skim-milk powder, 2 pounds of bonemeal, 1 pound of cod-liver oil, and ½ pound of salt was prepared. Added to this basal mixture were: For group K, 55 pounds of rolled barley and 15 pounds of peanut meal; for group L, 60 pounds of rolled oats and 10 pounds of peanut meal; for group M, 52 pounds of rolled wheat and 18 pounds of peanut meal; and for group N, 51 pounds of coarse-ground yellow corn and 19 pounds of peanut meal. Such proportions provided, in the complete ration, feeds having a nutritive ratio of 1:3.7 in each case.

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[2] FEEDS AND FEEDING, A HANDBOOK FOR THE STUDENT AND STOCKMAN. By F. B. Morrison. Ed. 20, unabridged, 1050 pp., illus. The Morrison Publishing Co., Ithaca, N. Y., 1938.

[3] The ratio of digestible protein to digestible fats and carbohydrates.

FEED REQUIREMENTS FOR THE VARIOUS GROUPS COMPARED

The feed requirements to make 100 pounds of gain in live weight have been calculated upon the marketable live-weight gain of those finishing to a weight of 6 pounds and considering total feed given the group including that consumed by those that died. Because some of the rations contained green feed and others did not and because concentrates like oats and barley are more fibrous than wheat, the feed requirements per 100 pounds of gain were calculated upon a total digestible-nutrient basis from Morrison's tables. These standards are averages based upon digestion trials with livestock other than rabbits. All rations having similar ingredients and also having a nutritive ratio of 1:3.7 were rearranged in such a manner that totals and averages could be found in order to give ready comparisons (table 1).

Though all rabbits were started on the experiment when 58 to 63 days of age there was considerable difference between the groups as to range and average initial weight. Some of these differences were due to sickness (enteritis not associated in any way with kinds of feed) during the suckling period and some to quality of feed. A ration having a nutritive ratio of 1:3.2, fed to group C, and a ration with a nutritive ratio of 1:2.8, fed to group D, produced heavier average initial weights (3.61 and 3.71 pounds, respectively) than did any of the rations having a nutritive ratio of 1:3.7 or wider. These findings were substantiated in later investigations. Heavy protein feeding of rabbits during the suckling period is essential in order to get maximum gain. Just why the rabbits in group A, getting a feed having a nutritive ratio of 1:4.4, had attained such desirable weights at weaning is not clear. It is unusual for suckling rabbits on such a wide ration to do so well.

The number of days required for the rabbits to attain a live weight of 6 pounds varied from 14 to 105, depending primarily, of course, upon their initial weight and general thriftiness. The average number of days required for each group as a whole to attain a 6-pound weight varied from 40.4 days for the group (D) getting the highest protein ration to 61.7 days for one (F) of the groups used to test peanut meal in a ration of average protein content, i. e., having a nutritive ratio of 1:3.7. One lot in group F and lot I in group H were kept in developing pens and became heavily infested with coccidia.

The rabbits in group G had the most efficient production of any of the groups. The same ration when fed dry to lots I to III of group H required 10 percent more total digestible nutrients to make the 100 pounds' gain. The dry ration containing peanut meal, on the other hand, required about 9 percent less total digestible nutrients than similar moistened rations.

TABLE 1.—*Comparison of groups of rabbits with respect to feeding, gains, and mortality*

Group	Supplement or principal supplement to basal diet	Condition of ration	Nutritive ratio 1:—	Animals finishing to 6 pounds								Rank of feed based on digestible-nitrient requirement	Animals dying during experiment		Total gain
				Number	Initial weight		Days required to attain weight		Requirements, per 100 pounds' gain, of—[1]				Number	Per cent	
					Range	Average	Range	Average	Total feed[2]	Green feed	Digestible nutrients				
					Lb.	*Lb.*	*No.*	*No.*	*Lb.*	*Lb.*	*Lb.*				*Lb.*
B	Peanut meal	Wet	3.7	19	2.60–4.30	3.38	28–70	56.0	724		434	9	2	9.5	3.3
E	do	Dry	3.7	53	2.26–4.40	3.35	28–70	48.2	669		402	5	12	18.5	3.8
F	do	Wet	3.7	32	1.70–4.23	2.95	35–98	61.7	859	134	455	14	11	25.6	14.5
	Total or average.		3.7	104	1.70–4.40	3.23	28–98	53.8	730	45	425		25	18.6	21.6
G	Soybean meal	Wet	3.7	50	1.90–4.40	3.11	28–91	54.2	706	93	382	1	10	16.7	8.3
H, lots I to III	do	Dry	3.7	36	2.27–3.73	3.23	35–98	59.9	794	121	422	9	5	12.2	3.6
	Total or average.		3.7	86	1.90–4.40	3.16	28–98	56.6	739	104	398		25	22.5	11.9

H, lot IV	Cottonseed meal	Wet	3. 7	11	2. 13–3. 83	3. 03	35–63	45. 8	649	------	393	3	6	35. 3	2. 2
I	Linseed meal	do	3. 7	27	1. 83–4. 23	3. 07	28–77	52. 6	722	102	386	2	5	15. 6	2. 8
J	Sesame meal	do	3. 7	17	2. 60–4. 43	3. 42	28–77	47. 8	741	------	448	13	6	26. 1	1. 6
K	Barley	Dry	3. 7	58	2. 10–4. 60	3. 43	21–105	47. 1	721	------	444	12	12	17. 1	9. 4
L	Oats	do	3. 7	55	1. 57–4. 00	3. 03	35–84	59. 0	738	------	432	11	10	15. 4	4. 8
M	Wheat	do	3. 7	98	1. 57–5. 20	3. 44	14–98	46. 4	663	------	404	6	16	14. 0	9. 1
N	Cornmeal	do	3. 7	48	1. 77–4. 60	3. 14	21–91	52. 2	677	------	418	8	7	12. 7	8. 4
	Grand total or average.[2]	------	3. 7	504	1. 57–5. 20	3. 22	21–105	52. 6	722	38	418	------	102	16. 8	71. 8
A	None	Wet	4. 4	26	2. 23–5. 23	3. 57	21–77	44. 4	670	------	399	4	6	18. 8	4. 2
C	Peanut meal	do	3. 2	37	2. 40–5. 10	3. 61	21–77	45. 2	684	------	415	7	13	26. 0	2. 9
D	do	do	2. 8	43	2. 83–4. 33	3. 71	21–56	40. 4	704	------	425	10	15	25. 9	10. 6

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[1] Weight given for wet feeds is that before moistening.

[2] Arithmetical average.

The rations containing soybean meal as a supplement were 6.8 percent more efficient than those with the peanut supplement. The requirement for rabbits in groups B, E, and F was approximately 7 percent greater than for those in groups G and H (table 1). On the whole, soybean meal appears to make the most satisfactory protein supplement for rabbits from weaning time until such time as they weigh 6 pounds because of its wide production and ready availability. Linseed meal, though efficient, is required in so much greater quantity to bring the ration to the same level of protein that the feed cost under normal conditions would exceed that of the other rations. The ration containing sesame meal, fed to group J, was next to the least efficient of all the rations, though the small number of animals prevents the drawing of definite conclusions. Rations containing oats, fed to group L, and barley, fed to group K, were also low in efficiency. Wheat and corn proved to be about average in efficiency.

The 504 rabbits that attained a weight of 6 pounds on various rations all having a nutritive ratio of 1:3.7 required 722 pounds of feed, 38 pounds of which was green feed and 60 percent alfalfa hay, to make 100 pounds of gain in live weight. These rabbits had an average initial weight of 3.22 pounds and required an average of 52 days to attain a weight of 6 pounds. Approximately 18 percent died during this period. The feed consumed by the animals that died was charged against those that finished. When converted to a total digestible-nutrient basis it was found that 418 pounds was required to make 100 pounds of gain. The 26 rabbits in group A reaching 6 pounds, getting a feed having a nutritive ratio of 1:4.4, made the 100 pounds of total gain on only 399 pounds of total digestible nutrients, which is nearly 5 percent less than that required by the large number of rabbits on feed having a nutritive ratio of 1:3.7.

Three groups, G, I, and lot IV of group H, getting rations having a nutritive ratio of 1:3.7 did, however, require less total digestible nutrients than those on the 1:4.4 ration. The total digestible-nutrient requirements for the rabbits in group D on the ration having the narrowest nutritive ratio, 1:2.8, were greater than average. The costs of feed having such a narrow ratio are also greater because of the inclusion of larger quantities of the more expensive protein supplement. It is questionable whether rabbits of this age would eat so much protein if they were allowed to select their own ingredients. The general conclusion is that rations having nutritive ratios between 1:3.2 to 1:4.4 will be most satisfactory for developing rabbits to 6 pounds in weight.

The data on feed requirements are not definite. There apparently are disturbing factors including losses due to disease. The experiment was conducted, however, under conditions that are representative of those encountered by the average rabbit grower. The loss from rabbits which are salable at weaning time and subsequently die must be charged as part of the cost on carrying rabbits to heavier weights. A rabbit under 3 pounds' live weight when weaned at 8 weeks of age is not readily salable and will require extra feeding. Even some of these will die before they can be marketed. The picture will remain confused until the mortality factor can be brought under control.

SEASONAL FEED REQUIREMENTS

The effect of season on feed requirements to produce 100 pounds of gain is shown in table 2. As this table was organized on the basis of months during which the rabbits were started on the experiment. the actual average period in which they were on feed was somewhat later than the table shows. The months were grouped by pairs in order to have a sufficient number of animals to make satisfactory comparisons. The grouping is in accordance with the general average-temperature conditions in the southern California area (fig. 3). The May–June period is the season of the year at which the greatest rabbit production occurs. No rabbits were started on feed during the month of November. The average initial weights are fairly comparable in all groups except that of the March–April group. The percentage of animals lost was the greatest during the last 4 months of the year.

Table 2.—*Total digestible nutrients required by rabbits to produce 100 pounds of gain. by bimonthly periods, and mortality during the experiment*

Period in which rabbits were started on experiment	Rabbits finishing to 6 pounds				Rabbits dying during experiment		
	Number	Average initial weight	Total live-weight gain	Total digestible nutrients per 100 pounds of gain [1]	Number	Percent	Total gain
		Pounds	*Pounds*	*Pounds*			*Pounds*
Jan.–Feb	67	3. 11	202. 14	418	11	14. 1	19. 64
Mar.–Apr	81	2. 82	269. 13	417	16	16. 5	17. 41
May–June	122	3. 34	348. 10	392	21	14. 7	10. 70
July–Aug	86	3. 52	225. 08	395	18	18. 9	7. 83
Sept.-Oct	99	3. 30	278. 06	458	21	20. 2	12. 78
Nov.–Dec	49	3. 29	138. 74	411	15	24. 6	3. 41
Total or average	504	3. 22	1, 461. 25	418	102	16. 8	71. 78

[1] Total feed given the group is considered.

Of the rabbits actually finishing the experiment, the two summer groups, May-June and July-August, had approximately a 4-percent lower requirement of total digestible nutrients than that of the rabbits in the November-December group and 6 percent lower than that of the January-February and March-April groups. The most inefficient groups were in the September-October period, when over 16 percent more total digestible nutrients were required to make the 100 pounds of gain than in the periods during the summer, May through August.

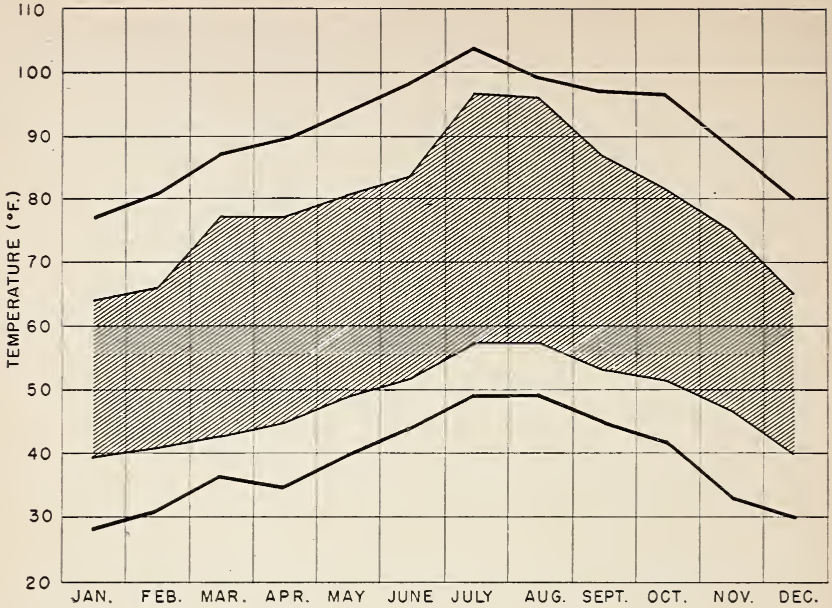

FIGURE 3.—Extreme and average temperatures over a 3-year period at Fontana, Calif.

EFFECT OF CASTRATION ON GAINS AND FEED REQUIREMENTS

Ninety-five bucks that were castrated at weaning time and their 107 litter-mate does were fed to a weight of 6 pounds on rations having nutritive ratios of 1:3.7 (table 3, part II). These castrated bucks required an average of 1 day longer than their litter-mate does to attain a weight of 6 pounds. The total digestible-nutrient requirement for 100 pounds of gain of these castrated bucks was approximately 10 percent greater than that for their litter-mate does.

During the earlier period, when the bucks were not castrated, the feed for the sexes was not recorded separately, so no feed-requirement comparisons between the sexes can be made there. The 160 does reaching 6 pounds, however, made 6.68 percent more rapid average daily gain in live weight per animal than their 142 uncastrated litter mates. The 107 does reaching 6 pounds in the lots in which their litter mates were castrated made 6.05 percent faster average daily gain per animal than the 95 castrated bucks which were litter mates. Rapidity of gain is closely associated with economy of gain. Since the total digestible-nutrient requirements of castrated bucks exceeded that for their litter-mate does and the does in the two groups made practically the same percentage more rapid average daily gain per animal over the two types of males, respectively, it is logical to believe that castration does not increase the utilization of the feed when the rabbits are to attain a weight no greater than 6 pounds.

TABLE 3.—*Influence of sex on gains, total digestible nutrients required to produce 100 pounds of gain, and mortality, in castrated and uncastrated bucks and their litter-mate does*

Sex	Rabbits finishing to 6 pounds						Rabbits dying during experiment		
	Number	Average initial weight	Average final weight	Experimental period	Total live-weight gain	Total digestible nutrients required per 100 pounds' gain	Number	Percent	Total gain
		Lbs.	*Lbs.*	*Days*	*Lbs.*	*Lbs.*			*Lbs.*
PART I OF EXPERIMENT									
Uncastrated bucks	142	3. 09	6. 14	58. 0	432. 87	[1] 404	31	17. 9	32. 52
Does	160	3. 07	6. 15	54. 9	492. 84		25	13. 5	20. 23
PART II OF EXPERIMENT									
Castrated bucks	95	3. 54	6. 15	46. 2	247. 51	458	20	17. 4	9. 80
Does	107	3. 44	6. 13	44. 9	288. 47	414	26	19. 5	9. 23
Total or average	504	3. 22	6. 14	52. 6	1, 461. 69	418	102	16. 8	71. 78

[1] Feed not kept separate for sexes.

AGE AND DISEASE IN RELATION TO FEED REQUIREMENTS

The total digestible-nutrient requirements per 100 pounds of gain in weight for each week beyond weaning up to arrival at 6 pounds of weight is shown in table 4. Only those animals on a feed having a nutritive ratio of 1:3.7 were considered. The requirement for each week is based upon the gains made by (1) all the rabbits reaching 6 pounds during that particular week, (2) all those that had to be carried an additional period of time beyond the immediate week under consideration, and also (3) animals dying during the particular week. During these experiments, slightly more than 18 percent of the animals died, and disease was partly responsible. In rabbits a condition called bloat (enteritis) is prevalent and as yet no cure is known for it. About 50 percent of the animals recover but during the recovery period gains are slow and expensive. The method used does not give true comparisons because the thriftiest animals were eliminated from week to week as they attained the desired weight. In other words, the percentage of "poor doers" increased progressively as the experiment continued. The data at hand do not permit of any other method of analysis. During the first and second week the average total digestible-nutrient requirement is based upon about 550 animals making total weekly gains of considerably better than 200 pounds of live weight. This total digestible-nutrient requirement is slightly under 300 pounds. The approximately 500 rabbits during the third and the fourth weeks required about 360 pounds of total digestible nutrients. This shows definitely that 11- to 13-week old rabbits require 20 percent more total digestible-nutrients to make 100 pounds of gain than 9- to 11-week-old rabbits do. The total digestible-nutrient requirement for each subsequent week after the fourth through the eighth is progressively higher. The feed consumed by animals dying, when charged against the gains made by the animals finishing, naturally makes the requirements higher.

TABLE 4.—*Relation between age of rabbits and digestible nutrients required per 100 pounds of gain in weight*

Weeks beyond weaning	Rabbits	Amount of gain	Digestible nutrients per 100 pounds of gain
	Number	*Pounds*	*Pounds*
1	564	215	294
2	547	271	285
3	525	224	362
4	492	225	353
5	453	177	438
6	376	147	481
7	287	108	530
8	203	64	637
9	137	52	552
10	73	23	705
11	36	9	889

SEX IN RELATION TO GRADE OF CARCASS

Of the 610 animals that finished this experiment, 532, or more than 87 percent, were slaughtered.

The carcasses were classified into fryer (under 3 pounds) and roaster (3 pounds and over), and were graded according to tentative Government standards into Prime, Choice, and Commercial carcasses. Carcasses of Prime and Choice grades are shown in figure 4.

Ten of the 532 carcasses were classified as fryers; the rest were roasters. The fryers were produced in part I of the experiment; 2 of them were males and 8 were females. All 10 carcasses were graded Choice except 1, which was graded Commercial. These fryer carcasses were produced on 7 different rations and were slaughtered in 5 different months. Only 3 of the carcasses were more than 0.1 pound

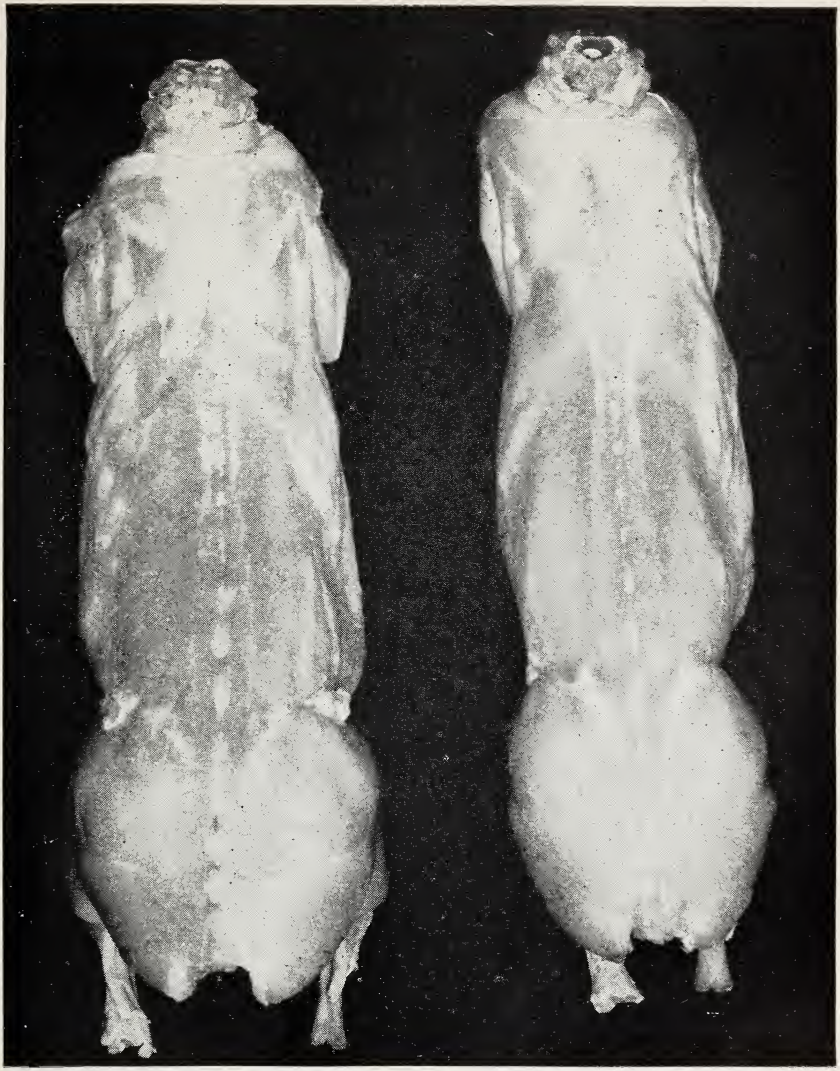

FIGURE 4.—Carcasses of New Zealand rabbits which had weighed approximately 6 pounds. The plumper, better conditioned carcass to the left was graded Prime; the other, Choice.

under the required 3-pound weight for roasters and some of them were only 0.01 and 0.02 pound light.

The data on all of these fryer carcasses have been included in their respective groups in tables 5 to 9 inclusive.

For some unexplainable reason the percentages of the Prime grades of carcasses in part I and part II of the experiment varied materially (table 5). In part I only about 25 percent of the 278 carcasses graded Prime, while in part II more than 50 percent of the 254 graded Prime.

A little over 6 percent of all carcasses in both parts were put into the Commercial grade.

Table 5.—*Relation between sex of rabbits and grade of carcasses*

Sex	Carcasses according to grade						Total number of carcasses
	Prime		Choice		Commercial		
	Number	*Percent*	*Number*	*Percent*	*Number*	*Percent*	
Part I of Experiment							
Bucks	32	24.4	89	67.9	10	7.7	131
Does	37	25.2	102	69.4	8	5.4	147
Total	69	24.8	191	68.7	18	6.5	278
Part II of Experiment							
Bucks (castrated)	62	51.2	54	44.6	5	4.2	121
Does	69	51.9	53	39.8	11	8.3	133
Total	131	51.6	107	42.1	16	6.3	254
Parts I and II of Experiment Combined							
Bucks	94	37.3	143	56.7	15	6.0	252
Does	106	37.8	155	55.4	19	6.8	280
Total	200	37.6	298	56.0	34	6.4	532

Castration did not increase the percentage of Prime carcasses over that of their litter-mate does. The combined data show essentially no difference due to sex in the grade of carcass produced from 6-pound rabbits.

SEASONAL INFLUENCE ON CARCASS GRADES

The effect of the seasons on the grade of carcass produced is shown in table 6. The tabulation has been made on the basis of the period in which the rabbits were actually killed and consequently should not be confused with table 2. Parts I and II of the experiment were not combined because of unexplainable differences in percentage of various grades.

In part I the highest percentage of Prime carcasses were produced in the July-August period. Commercial carcasses were produced only during the May-June period. Four of the months, however, are not represented in part I.

TABLE 6.—*Relation between bimonthly period in which rabbit was killed and grade of carcasses*

PART I OF EXPERIMENT

Period in which rabbits were killed	Grade of carcasses						Total number of carcasses
	Prime		Choice		Commercial		
	Number	*Percent*	*Number*	*Percent*	*Number*	*Percent*	*Number*
March-April	8	24. 2	25	75. 8	0	0	33
May-June	8	9. 4	59	69. 4	18	21. 2	85
July-August	49	40. 5	72	59. 5	0	0	121
November-December	4	10. 2	35	89. 8	0	0	39
Total	69	24. 8	191	68. 7	18	6. 5	278
PART II OF EXPERIMENT							
January-February	36	73. 5	13	26. 5	0	0	49
March-April	13	43. 3	17	56. 6	0	0	30
May-June	18	62. 1	11	37. 9	0	0	29
July-August	14	70. 0	5	25. 0	1	5. 0	20
September-October	17	31. 5	22	40. 7	15	27. 8	54
November-December	33	40. 2	39	47. 6	10	12. 2	82
Total	131	51. 6	107	42. 1	16	6. 3	254

In part II, all bimonthly periods are represented, but with varying numbers of animals slaughtered. Nearly three-fourths of the carcasses of the January-February and the July-August periods were graded as Prime. The lowest percentage of Prime carcasses was found in the September-October period, which is also the period which produced the highest percentage of Commercial carcasses.

COMPARISON OF STANDARD CUTS

Whole dressed carcasses including liver, heart, and kidneys (fig. 4) were weighed. After each had been graded, it was cut into the following standard portions: Hind legs, loin, forequarter without legs, front legs, and liver (fig. 5). Separate weights were recorded, as were some weights of the byproducts, skin, feet, and head. The loin was cut from the forequarter immediately back of the last rib and from the hind legs squarely across the carcass in front of the hip joint, thereby leaving the abdominal membrane on this loin portion. The weights and percentage values on the basis of live weight, segregated as to grade of carcass, are given in table 7.

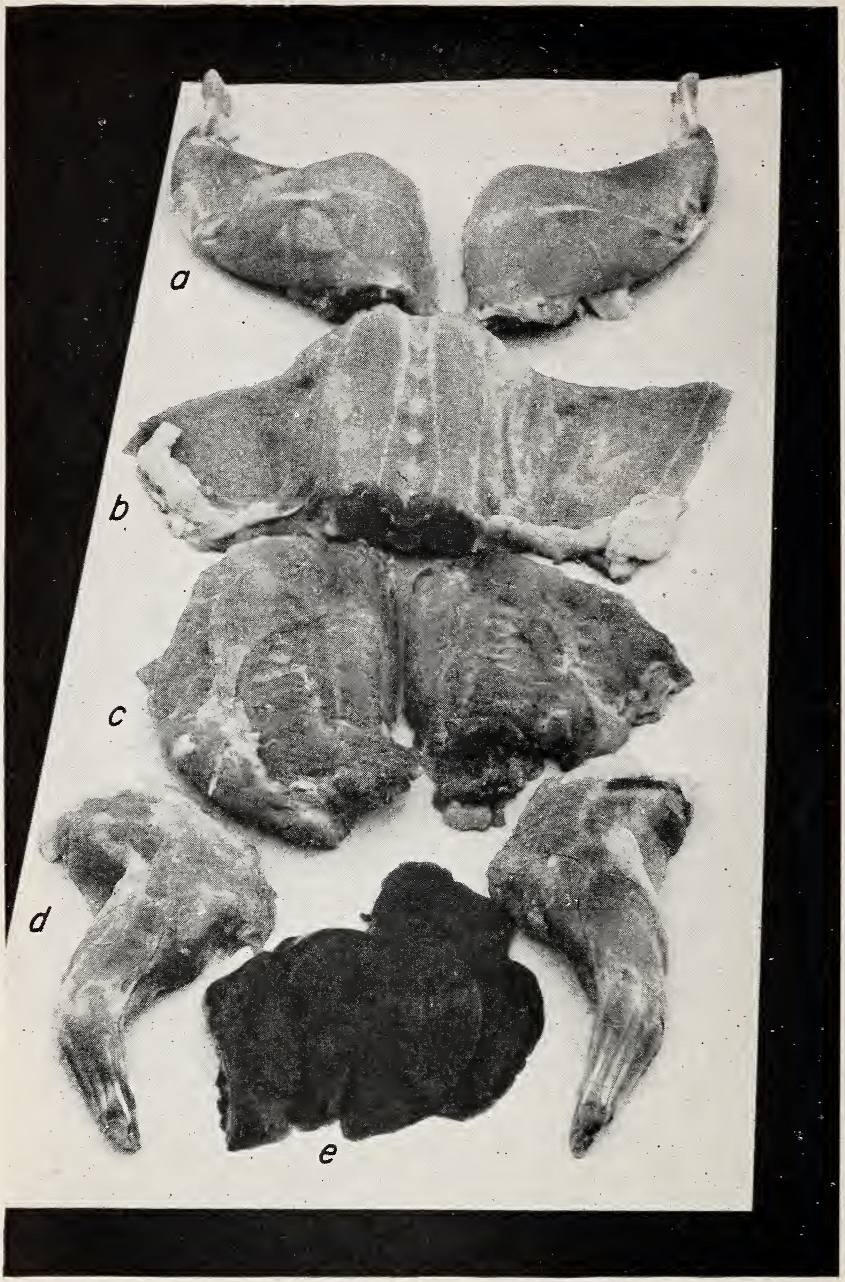

FIGURE 5.—Standard cuts of domestic rabbit meat: *a*, Hind legs; *b*, loin; *c*, forequarter without legs; *d*, front legs; and *e*, liver.

TABLE 7.—*Relation of weight of carcass and of various cuts and byproducts to live weight of approximately 6 pounds, by grades*

Grade of carcass	Total carcasses	Averave live weight	Average dressed weight including liver and kidneys		Weights and percentages of indicated cuts and byproducts of carcass									
					Liver and heart		Hind legs		Loin		Front quarter without legs		Front legs	
	Number	*Pounds*	*Pounds*	*Percent*	*Pounds*	*Percent*	*Pounds*	*Percent*	*Pounds*	*Percent*	*Pounds*	*Percent*	*Pounds*	*Percent*
Prime	200	6. 18	3. 39	54. 9	0. 27	4. 4	1. 17	19. 0	0. 86	13. 9	0. 68	11. 1	0. 41	6. 7
Choice	298	6. 14	3. 31	53. 9	. 25	4. 1	1. 17	19. 0	. 81	13. 2	. 67	10. 9	. 41	6. 7
Commercial	34	6. 11	3. 23	52. 9	. 23	3. 8	1. 17	19. 1	. 76	12. 4	. 66	10. 8	. 41	6. 7

Grade of carcass	Total carcasses	Average live weight	Average dressed weight including liver and kidneys		Weights and percentages of indicated cuts and byproducts of carcass—Continued							
					Four feet		Head with ears		Skin			
									Green		Dry	
	Number	*Pounds*	*Pounds*	*Percent*	*Pounds*	*Percent*	*Pounds*	*Percent*	*Pounds*	*Percent*	*Pounds*	*Percent*
Prime	200	6. 18	3. 39	54. 9	0. 19	3. 0	0. 47	7. 6	0. 58	9. 4	0. 26	4. 2
Choice	298	6. 14	3. 31	53. 9	. 18	2. 9	. 47	7. 6	. 58	9. 4	. 25	4. 1
Commercial	34	6. 11	3. 23	52. 9	. 18	2. 9	. 48	7. 8	. 56	9. 2	. 22	3. 6

A 6-pound New Zealand rabbit will dress out slightly more than 3¼ pounds of carcass including liver, heart, and kidneys, or about 53 percent of its live weight. The primary difference between carcass grades is in the loin, where most of the additional fat of the better grades of carcasses is deposited, and in the liver and heart. A proportionately larger size in these important internal organs is conducive to the more efficient functioning of the animal body. In California when the carcass is sold without being cut up it is required that the liver be attached. Rabbit liver has been found to be comparable to chicken liver in its high nutritive qualities. It frequently is sold separately from the meat at considerably higher prices.

The proportion of front quarter without legs increases as the quality of the carcass decreases. Undoubtedly many points of difference observable by the eye but not recorded by the scales exist between the several grades of carcasses. The relation of the weight of standard cuts of rabbit meat to the weight of the carcass, by grades, is given in table 8.

TABLE 8.—*Relation of weight of standard cuts of rabbit meat to weight of entire carcass, by grades*

Grade of carcass	Carcasses in each grade	Average carcass weight	Proportion of indicated cut of carcass				
			Hind legs	Loin	Front quarter without legs	Front legs	Liver
	Number	*Pounds*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Prime	200	3. 39	34. 5	25. 4	20. 0	12. 1	8. 0
Choice	298	3. 31	35. 3	24. 5	20. 2	12. 4	7. 6
Commercial	34	3. 23	36. 3	23. 5	20. 4	12. 7	7. 1

The two hind legs and the loin (much desired portions) of a 6-pound New Zealand rabbit will weigh nearly 2 pounds, constituting approximately 60 percent of the total carcass weight. The liver is about 8 percent of the total weight.

INFLUENCE OF SEX ON STANDARD CUTS

A comparison of the proportion of the weight of various cuts of carcasses to the live weight of bucks and litter-mate does having the same grade of carcass is given in table 9. The forequarters without legs and the front legs were slightly heavier in the bucks than in their litter-mate does. Otherwise there was practically no difference in the weights of the edible portions of these 6-pound rabbits. The data show that the heads of the bucks were heavier than those of the does.

TABLE 9.—*Relations between sex and the proportion of the weights of various standard cuts to the live weight of rabbits, by grades of carcasses*

Grade of carcass	Sex [1]	Total animals	Average live weight	Proportion of indicated cuts and byproducts of carcass									
				Carcass including liver		Hind legs		Loin		Front quarters without legs		Front legs	
		Number	*Pounds*	*Pounds*	*Percent*	*Pounds*	*Percent*	*Pounds*	*Percent*	*Pounds*	*Percent*	*Pounds*	*Percent*
Prime	Bucks	94	6.17	3.39	54.9	1.17	19.0	0.85	13.8	0.69	11.2	0.42	6.8
	Does	106	6.19	3.39	54.8	1.18	19.1	.86	13.9	.68	11.0	.41	6.6
Choice	Bucks	143	6.14	3.31	53.9	1.17	19.0	.80	13.0	.67	10.9	.42	6.8
	Does	155	6.14	3.30	53.7	1.17	19.0	.81	13.2	.66	10.7	.40	6.5
Commercial	Bucks	15	6.11	3.26	53.4	1.18	19.3	.76	12.4	.66	10.8	.41	6.7
	Does	19	6.12	3.25	53.0	1.17	19.1	.77	12.6	.66	10.8	.41	6.7

Grade of carcass	Sex [1]	Total animals	Average live weight	Proportion of indicated cuts and byproducts of carcass—Con.							
				Head with ears		Four feet		Skin			
								Green		Dry	
		Number	*Pounds*	*Pounds*	*Percent*	*Pounds*	*Percent*	*Pounds*	*Percent*	*Pounds*	*Percent*
Prime	Bucks	94	6.17	0.48	7.8	0.19	3.1	0.58	9.4	0.26	4.2
	Does	106	6.19	.46	7.4	.18	2.9	.58	9.4	.26	4.2
Choice	Bucks	143	6.14	.48	7.8	.19	3.1	.59	9.6	.25	4.1
	Does	155	6.14	.46	7.5	.18	2.9	.56	9.1	.24	4.1
Commercial	Bucks	15	6.11	.49	8.0	.18	2.9	.56	9.2	.25	4.1
	Does	19	6.12	.46	7.5	.18	2.9	.57	9.3	.20	3.3

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[1] Some of the bucks were castrated.

SUMMARY AND CONCLUSIONS

More than 600 New Zealand rabbits after weaning at 56 days of age were continued on their specific type of ration at the U. S. Rabbit Experiment Station, Fontana, Calif., until they reached 6 pounds' live weight. Rations testing peanut meal, soybean meal, linseed meal, cottonseed meal, sesame meal, barley, oats, wheat, and corn supplementary to a basal diet were formulated on a 1:3.7 nutritive ratio. Additional rations having nutritive ratios of 1:4.4, 1:3.2, and 1:2.8 were also fed. In all rations, 3 parts of alfalfa hay were fed for 2 parts of concentrate mixture.

The groups getting the soybean meal required 56.6 days beyond weaning to reach a weight of 6 pounds and used 398 pounds of total digestible nutrients to make the 100 pounds of gain. The groups fed peanut meal required 53.6 days and 425 pounds of total digestible nutrients, or about 7 percent more.

The requirements of digestible nutrients per 100 pounds of gain for the oats, and barley-fed groups of rabbits were 432 and 444 pounds, respectively. Approximately 722 pounds of feed, of which 38 pounds was of a succulent nature and 60 percent was alfalfa, was required to put 100 pounds of gain on 504 rabbits from weaning to arrival at 6 pounds' live weight. The total digestible-nutrient requirement was 418 pounds per 100 pounds of gain. Rabbits fed during May through August required less total digestible nutrients for 100 pounds of gain than those fed in March–April, November–December, and September–October periods, the total digestible nutrients for these periods being 2.4, 5.0, and 14.5 percent greater, respectively, on the basis of total gain. Castrated bucks required 10 percent more total digestible nutrients for 100 pounds of gain than their litter-mate does. The total digestible-nutrient requirement for the gain in live weight during the first 2 weeks after weaning was approximately 300 pounds and the requirement increased progressively through the eighth week, when the total digestible-nutrient requirement was 640 pounds. Sex of the animals had essentially no effect on grade of carcass. The lowest average grade of carcass was produced in the period September–October and the most satisfactory in the January–February period.

The dressing percentages including liver, heart, and kidneys of Prime, Choice, and Commercial carcasses were 54.9, 53.9, and 52.9, respectively. The relative average weights of the loin portions and the heart and liver were in direct proportion to the respective grades. The two hind legs and the loin comprised 60 percent of the carcass of a 6-pound rabbit and weighed approximately 2 pounds.

There is practically no difference in weight between standard cuts from bucks and from does weighing 6 pounds.

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